The opinion in support of the decision being entered today was ***not*** written for publication and is ***not*** binding precedent of the Board.

Paper No. 13

UNITED STATES PATENT AND TRADEMARK OFFICE

_____

BEFORE THE BOARD OF PATENT APPEALS
AND INTERFERENCES

_____

Ex parte STEVE HSIA and YIN HU

_____

Appeal No. 2001-0399
Application No. 09/089,795

_____

ON BRIEF

_____

Before WILLIAM F. SMITH, LIEBERMAN and POTEATE, ***Administrative Patent Judges***.

POTEATE, ***Administrative Patent Judge***.

DECISION ON APPEAL

This is an appeal under 35 U.S.C. § 134 from the final rejection of claims 17-23, which are all of the claims pending in the application.

Claim 17 is representative of the subject matter on appeal and is reproduced below:[1]

17. A method for fabricating an integrated circuit, comprising the steps of:
forming a conductive layer over a semiconductor body;
forming a patterned hardmask over said conductive layer;
depositing a layer of refractory metal over said patterned hardmask and said conductive layer;
reacting a portion of said refractory metal layer with said conductive layer to form a silicide at a surface of said conductive layer except under said patterned hardmask;
removing an unreacted portion of said refractory metal layer;
removing said patterned hardmask;
selectively etching said conductive layer using said silicide as a mask.

The references relied upon by the examiner are:

Grewal	5,591,301	Jan. 7, 1997
Hayashi et al. (Hayashi)	5,576,244	Nov. 19, 1996

GROUND OF REJECTION

Claims 17-23 stand rejected under 35 U.S.C. § 103 as unpatentable over Grewal in view of Hayashi.

We reverse.

[1] Claim 23, the only other independent claim, differs from claim 17 in specifying a "reverse" patterned hardmask.

BACKGROUND

The invention relates to a method for fabricating an integrated circuit. Appeal Brief, Paper No. 8, received April 20, 2000, page 2, Summary of the Invention. According to the method, a conductive layer is selectively etched using a silicide as a mask, thereby avoiding the need for a photoresist and reducing the formation of unwanted polymers. ***Id.*** In addition, use of the silicide mask avoids the need to etch through both a silicide layer and a conductive layer. ***Id.***

DISCUSSION

The initial burden of presenting a ***prima facie*** case of obviousness rests on the examiner. ***In re Oetiker***, 977 F.2d 1443, 1445, 24 USPQ2d 1443, 1444 (Fed. Cir. 1992). In determining whether an invention is obvious, the examiner must consider: (1) the scope and content of the prior art; (2) the differences between the prior art and the claimed invention; (3) the level of ordinary skill in the art; and (4) any objective considerations that may be present. ***Graham v. John Deere Co.***, 383 U.S. 1, 17-18, 148 USPQ 459, 466-67 (1966). To establish a

prima facie case of obviousness, the examiner must identify a suggestion or motivation to modify the teachings of the prior art to achieve the claimed invention. ***See In re Kotzab***, 217 F.3d 1365, 1370, 55 USPQ2d 1313, 1316-17 (Fed. Cir. 2000). The suggestion or motivation to modify a reference may be implicit from the prior art as a whole rather than expressly stated. ***Id.*** However, regardless of whether the examiner relies on an express or implicit showing, he must provide reasons for finding a limitation to be taught or suggested in the reference. ***Id.***

The examiner found that Grewal teaches the invention as claimed with the exception of the following:

(1) Grewal does not disclose the step of reacting metal with a conductive (polysilicon)layer to form metal silicide;

(2) Grewal deposits a hardmask over a refractory metal, whereas the refractory metal is blanket deposited over the hardmask in the method of the invention; and

(3) Grewal does not remove the hardmask.

Examiner's Answer, Paper No. 9, mailed June 23, 2000, page 3. However, according to the examiner, it would have been obvious to have modified the method of Grewal in view of the teachings in

Hayashi to have achieved the invention as claimed. ***See id.,*** pages 3-5.

When determining the patentability of a claimed invention which combines two known elements, "the question is whether there is something ***in the prior art*** as a whole to suggest the desirability, and thus the obviousness, of making the combination." ***Lindemann Maschinenfabrik GMBH v. American Hoist & Derrick Co.***, 730 F.2d 1452, 1462, 221 USPQ 481, 488 (Fed. Cir. 1984)(emphasis added). The following comparison of the facts and reasons relied upon by the examiner in support of obviousness of the invention versus appellants' arguments evidences that the examiner has impermissibly relied upon "hindsight reconstruction to pick and choose among isolated disclosures in the prior art to deprecate the claimed invention." ***In re Fine***, 837 F.2d 1071, 1075, 5 USPQ2d 1596, 1600 (Fed. Cir. 1988).[2]

[2]When analyzing a patent claim for obviousness, the claim should be considered as a whole, although differences between the claim and the prior art must be identified to place the obviousness analysis into perspective. ***Ryko Mfg. Co. v. Nu-Star Inc.***, 950 F.2d 714, 717, 21 USPQ2d 1053, 1056 (Fed. Cir. 1991).

1. The step of reacting metal with a polysilicon layer to form metal silicide

Grewal teaches a plasma etching method wherein a first layer of a doped polysilicon is deposited onto a substrate followed by depositing a conductive refractory metal silicide layer. Grewal, column 3, line 66-column 4, line 2. According to the examiner, "Grewal is not particular about the method for forming metal silicide." Examiner's Answer, page 4. Thus, it would have been obvious to have formed the metal silicide by reacting metal with a polysilicon layer in view of Hayashi's disclosure of a step of reacting metal with a conductive layer in a semi-conductor fabrication technique. ***Id.***, pages 3-4, see page 6.

Appellants argue that Grewal specifically teaches that the refractory metal silicide layer is "deposited, as by sputtering." Reply Brief, Paper No. 10, received August 22, 2000, page 2 (referencing Grewal, columns 3 and 4). Moreover, appellants note that in Hayashi, the step of reacting metal with a conductive layer is utilized for an entirely different purpose. In particular, appellants note that:

> Hayashi's silicide process takes place after the gate electrode has been deposited, patterned and etched. Refractory metal 27 is not used to silicide any portion of the gate electrode. Refractory metal 27 is only used to silicide the surface of the substrate. Hayashi does not disclose or suggest to one of ordinary skill in the art reacting refractory metal with a portion of a conductive layer prior to etching the conductive layer.

Appeal Brief, page 4, lines 18-23.

2. Reversing the Order of the Refractory Metal Layer and the Hardmask

According to the examiner, it would have been obvious to have reversed the order of deposition of the refractory metal and hardmask in view of Hayashi's teaching of depositing a refractory metal over a reverse hardmask. Examiner's Answer, page 4. The motivation for doing so is that "the hard mask will protect a portion of the underneath layer from reacting with the metal layer to form metal silicide." ***Id.***

Appellants argue that "Hayashi uses a silicon nitride layer to protect one layer while forming silicide at another layer." Appeal Brief, page 4. The silicide is not formed at the surface of the conductive layer as required by the claims, but is formed at the surface of the substrate. ***Id.*** Appellants urge that this disclosure does not provide a teaching or suggestion to

form a hardmask over a conductive layer followed by deposition of a layer of refractory material over the hardmask and conductive layer and, thereafter, reacting to form a silicide at a surface of the conductive layer except under the hardmask as required by the claims. ***Id.***, pages 4 and 5.

3. Removing the hardmask

According to the examiner, it would have been obvious to one of ordinary skill in the art at the time of the invention to have modified Grewal's method by removing the patterned hardmask, as this eliminates a multilayer mask during etching thereby resulting in reduced processing time. Examiner's Answer, page 4. Appellants argue that:

> In Grewal, the hard mask 16 is used as a mask for both the silicide and conductive layer etching. (One benefit of the claimed invention is [to, sic] avoid having to etch both the silicide and conductive layers.) In Hayashi, a resist mask is used for etching the silicon dioxide layer 25 and the conductive amorphous layer 24. (Another benefit of the invention is reducing the formation of polymers by eliminating the presence of photoresist during the etch of the conductive layer.) Both references retain the hard mask during the etch of the conductive layer.

Appeal Brief, page 5, lines 8-15.

For each of the above-identified differences between the invention and the prior art, the examiner has provided

reasons why one of ordinary skill in the art would have been motivated to modify Grewal in view of Hayashi to achieve the invention as claimed. However, the examiner has failed to identify where, ***in the prior art***, one of ordinary skill in the art would have found a disclosure or suggestion which would have led him to make the proposed modifications. ***See Kotzab***, 217 F.3d at 1371, 55 USPQ2d at 1317 ("[P]articular findings must be made as to the reason the skilled artisan, with no knowledge of the claimed invention, would have selected these components for combination in the manner claimed.").

In contrast, Appellants have persuasively shown that there is simply no teaching or suggestion in the references which would have led one of ordinary skill in the art to have combined the references as proposed by the Examiner to achieve the invention as claimed. Rather, the Examiner's motivation for combining the references was clearly gleaned from Appellants' specification.

Having concluded that the Examiner has failed the establish a ***prima facie*** case of obviousness, we reverse the rejection.

REVERSED

WILLIAM F. SMITH Administrative Patent Judge	)	
PAUL LIEBERMAN Administrative Patent Judge	)	BOARD OF PATENT APPEALS AND INTERFERENCES
LINDA R. POTEATE Administrative Patent Judge	)	

LRP:psb

Jacqueline Garner
Texas Instruments Incorporated
P.O. Box 655474
MS 3999
Dallas, TX 75265